CLAIMS

1. A process for producing a marking (45), for example digits, letters, surface patterns, surface images or decoration, on a substrate (43), preferably a film, in particular a transfer film,

wherein energy in the form of radiation, preferably laser radiation (30), is introduced from a controllable energy source into a replication surface of a replication apparatus (41) to produce at least one shaping region,

wherein the shaping region of the replication surface is shaped on to the substrate (43) by the replication apparatus (41) contacting the substrate (43) under pressure,

characterised in that

the replication surface is subjected to a temperature control effect at least in a partial region using an additional controllable energy source,

an energy input by radiation from the radiation source and an energy input from the additional controllable energy source is introduced into the replication surface so that at least one portion of the replication surface is in the form of a heat combination region, and

the shaping region is shaped on the substrate, wherein the portion of the replication surface which is in the form of the heat combination region directly and/or indirectly forms the shaping region.

2. A process as set forth in claim 1 characterised in that, for the moment in time of the shaping operation, the temperature of the replication surface outside the heat combination region is set to a temperature or a temperature range in the plastic temperature range of the substrate and the temperature of the replication surface within the heat combination region is set to a temperature or a temperature range in the flow temperature range of the substrate.

3. A process as set forth in claim 1 characterised in that, for the moment in time of the shaping operation, the temperature of the

replication surface outside the heat combination region is set to a temperature or a temperature range in the elastic temperature range of the substrate and the temperature of the replication surface within the heat combination region is set to a temperature or a temperature range in the plastic temperature range of the substrate.

4. A process as set forth in one of the preceding claims characterised in that the radiation introduced to produce the at least one shaping region is fed through the substrate (43), preferably outside the replication apparatus or through the replication apparatus.

5. A process as set forth in one of the preceding claims characterised in that a rotating replication roller (41) having the replication surface on its outside is used as the replication apparatus and the radiation is introduced into the replication surface of the replication roller before and/or while the heat combination region resulting therefrom comes into contact with the substrate (43) for the shaping operation.

6. A process as set forth in claim 5 characterised in that a counterpressure apparatus co-operating with the replication roller (41), preferably a counterpressure roller (42), is used, and the radiation for producing the at least one shaping region is supplied through the counterpressure apparatus (4) or parts of the counterpressure apparatus (42) into the replication surface of the replication roller (41).

7. A process as set forth in one of claims 5 and 6 characterised in that introduction of the radiation into the replication surface of the replication roller (41) is effected at a first angular position of the replication roller (41) and the shaping operation by contact of the replication surface of the replication roller (41) with the substrate (43) is effected at a second angular position of the replication roller (41), wherein, in the direction of rotation of the replication roller (41), an intermediate angle of less than

30°, in particular less than 5°, is set between the first angular position and the second angular position.

8. A process as set forth in one of the preceding claims characterised in that the radiation acts over an area and/or in point form sequentially on the replication surface, for example on the replication surface of the replication roller (41).

9. A process as set forth in one of the preceding claims characterised in that the position of the impingement point of the radiation on the replication surface is controllable by a one-dimensional or multi-dimensional movement of the radiation and/or the power density in relation to surface area of the radiation at the impingement point of the radiation on the replication surface is controllable.

10. A process as set forth in claims 5 through 9 characterised in that a control sequence for actuation of the radiation-producing device extends over more than one revolution of the replication roller (41).

11. Apparatus, preferably for carrying out the process as set forth in one of the preceding claims,

for producing a marking (45), for example digits, letters, surface patterns, surface images or decoration on a substrate (43), preferably a film, in particular a transfer film, comprising

a replication apparatus (41) which has a replication surface,

a device for producing a radiation (30), preferably a laser installation, wherein the radiation (30) for producing at least one shaping region is directed on to at least one portion (70a, b) of the replication surface, and

a counterpressure apparatus (42) which has a counterpressure surface, wherein the substrate (43) is arranged between the replication surface of the replication apparatus (41) and the counterpressure surface of the counterpressure apparatus (42) in order to shape the shaping region on

to the substrate in a contact region (53) between the replication surface and the substrate (43),

characterised in that

the replication surface is arranged on an outside of a replication roller (41).

12. Apparatus as set forth in claim 11 characterised in that the position in which the radiation acts on the portion of the replication surface during the irradiation operation and the position of the contact region between the replication surface and the substrate (43) are arranged in overlapping relationship and/or in the direction of rotation of the replication roller (41) are arranged with a spacing angle of a magnitude of less than 30°.

13. Apparatus as set forth in one of claims 11 and 12 characterised in that the radiation (30) for producing the at least one shaping region is fed through the counterpressure apparatus (42) or parts of the counterpressure apparatus (42).

14. Apparatus as set forth in one of claims 11 through 13 characterised in that the counterpressure apparatus (42), preferably in the region of the counterpressure surface, is transparent for the radiation (30).

15. Apparatus as set forth in one of claims 11 through 14 characterised in that the counterpressure apparatus is in the form of a counterpressure roller (42).

16. Apparatus as set forth in one of claims 11 through 15 characterised in that the counterpressure apparatus (42) is completely or portion-wise in the form of a hollow body, preferably a hollow cylinder, in particular a glass hollow cylinder, preferably with an inside surface which is parallel to and/or concentric with the counterpressure surface and in particular with a cylinder wall (100) which is transparent for the radiation.

17. Apparatus as set forth in one of claims 11 through 16 characterised in that the device for producing the radiation (30) and/or a beam deflection unit is arranged within the counterpressure apparatus (42) or within the replication roller (41).

18. Apparatus as set forth in one of claims 11 through 17 characterised in that the radiation (30) for producing the shaping regions is fed through the substrate (43).

19. Apparatus as set forth in one of claims 11 through 18 characterised in that there is provided an apparatus for temperature control of the replication surface, for example a heating apparatus and/or a cooling apparatus for heating or cooling the replication surface, in particular partial regions of the replication surface, which is preferably in the form of a blower, gas flow cooling, a cooling roller, a heating laser device, an inductive heating device, resistance heating or a device for producing heat radiation.

Abstract

The invention concerns an apparatus and a process for producing a marking on a substrate. Substrates marked in that way are applied to documents such as for example credit cards, personal identity cards or banknotes as security features for affording protection from forgery. Embodiments of these security features have diffractive or holographic structures. Production of the markings is produced by shaping from a mold. A change in the configuration of the marking is possible by changing the mold, which is time-consuming. The new apparatus and the new process are intended to permit the production of individualised markings on a substrate at a low level of apparatus expenditure. The new apparatus has a replication apparatus (41), in the form of a replication roller, having a replication surface, a device for producing a radiation (30) and a counterpressure apparatus (42) with a counterpressure surface, wherein a substrate (43) is arranged between the replication surface of the replication apparatus (41) and the counterpressure surface of the counterpressure apparatus (42) in such a way that a shaping region of the replication surface is shaped on to the substrate (43) in a contact region (53) between the replication surface and the substrate (43).

(Figure 1a)